

Transmission Report

Volume 1, No. 2

October 2010

Brains vs. Brawn Introducing the Sonnax SmartShell™

If you were at the 2010 Powertrain Expo in Texas last month, you probably noticed the crowd gathered around the Sonnax booth. What was all the fuss about?

The **Sonnax SmartShell** - our groundbreaking new alternative for the GM 4L60 family reaction sun gear shell. Attendees watched and listened with great interest as we demonstrated the mechanics behind the SmartShell, then went off to tell their friends that they had to check it out themselves. Everyone wanted to know more, so if you missed it at the show or were waiting for another look, here's the story behind the SmartShell...

- The aftermarket has responded to GM 4L60 series sun gear shell problems by beefing-up the part, however this fix is not immune from failure.
- Strengthening the shell does nothing to prevent damage to the small captive bearing in the rear planetary assembly.
- To tackle the root cause of all the sun gear shell's problems, a broader, smarter approach was needed.

The Problem

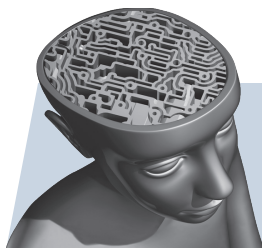
Complaints about the GM 4L60 sun gear shell are well documented all the way back to the introduction of the TH700-R4 in 1982. Whether a cracked spline hub or stripped splines, the failure results in the same familiar complaint: no reverse, no 2nd or 4th.

The aftermarket has responded to 4L60 sun gear shell problems through the years with various fixes which generally consist of stamping the part out of heavier gauge steel and hardening the splines to beef-up the part.

These fixes are marketed under names like the "Brute," "Beast," "Monster," "Animal," etc., designed to convey the idea that the part was strengthened to withstand the forces which caused the original part to fail. Even with significantly thicker and heavier material, however, none of these fixes are immune from failure.



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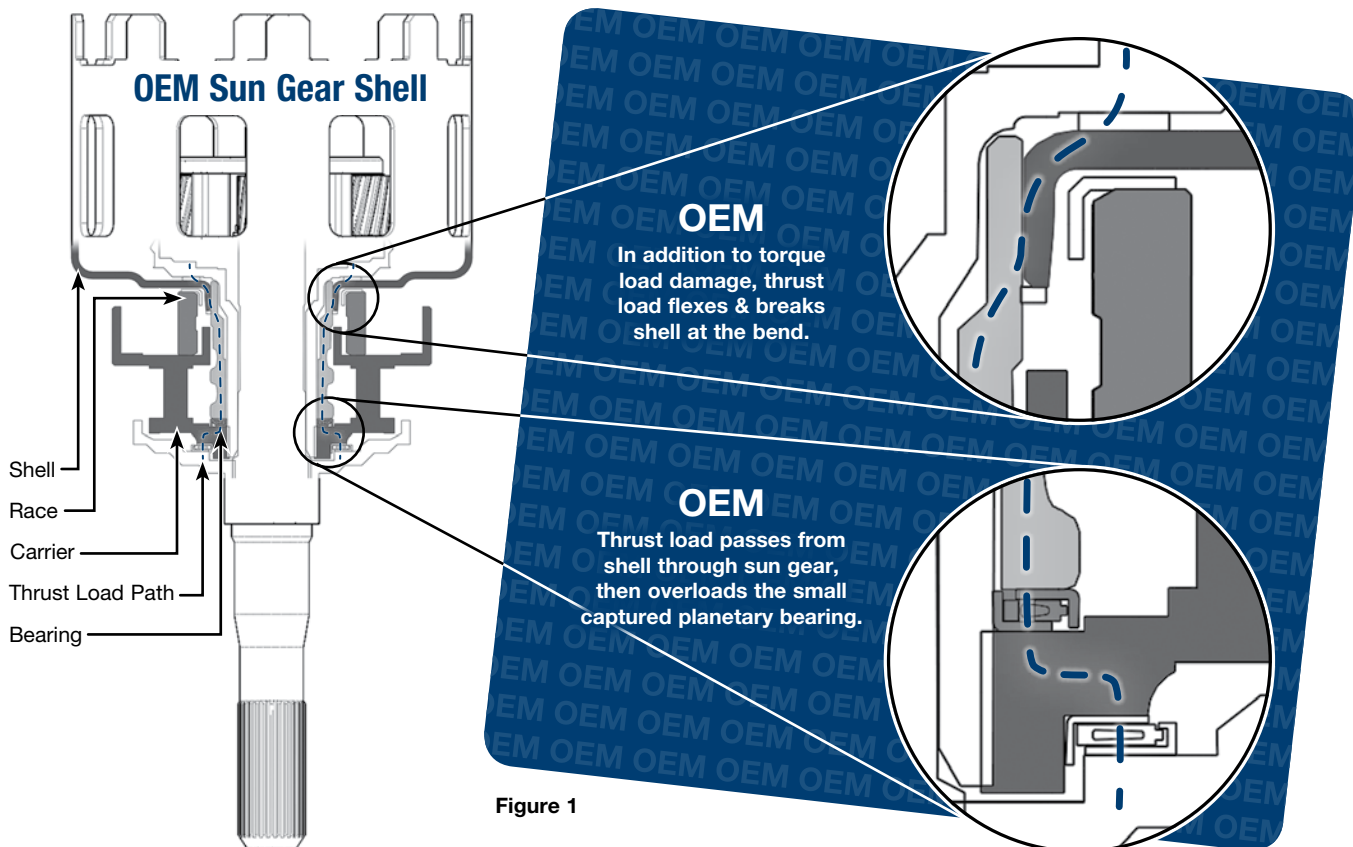


Figure 1

...continued from cover.

Sonnax: A Smarter Approach

Sonnax has felt for some time that the problem addressed by these beefed-up shells was too narrowly defined. In typical Sonnax fashion, we took a smarter approach. Our technicians and engineers looked at all the issues within this section of the transmission, including - but not limited to - the sun shell breakage. The result is the new Sonnax SmartShell™ (Part No. 77749-02K - patent pending).

In tackling the troublesome GM 4L60 sun gear shell, Sonnax deals with the obvious spline and hub issues first. We start with a stock shell, then reinforce the hub area with a proprietary collar electron beam welded around the hub. The splines undergo a tested machining and heat treating process to ensure increased strength and proper configuration. The lugs which engage the reverse drum are heat treated as well. This creates a stronger shell without the substantially increased weight found in traditional beefed-up shells.

Next, the plastic washer that fits between the shell and race is tossed out in favor of a substantial bearing. To make room for this bearing (much more on this later!), we reduced the height of the OEM roller clutch race. By carefully controlling the dimensions of the race, we controlled the end play issue that creates another problem...which is where the smarter approach by Sonnax really shines through.

Save the Planet!

When you buy the Sonnax SmartShell, you receive:



An improved, strengthened shell



A bearing assembly to replace the plastic washer

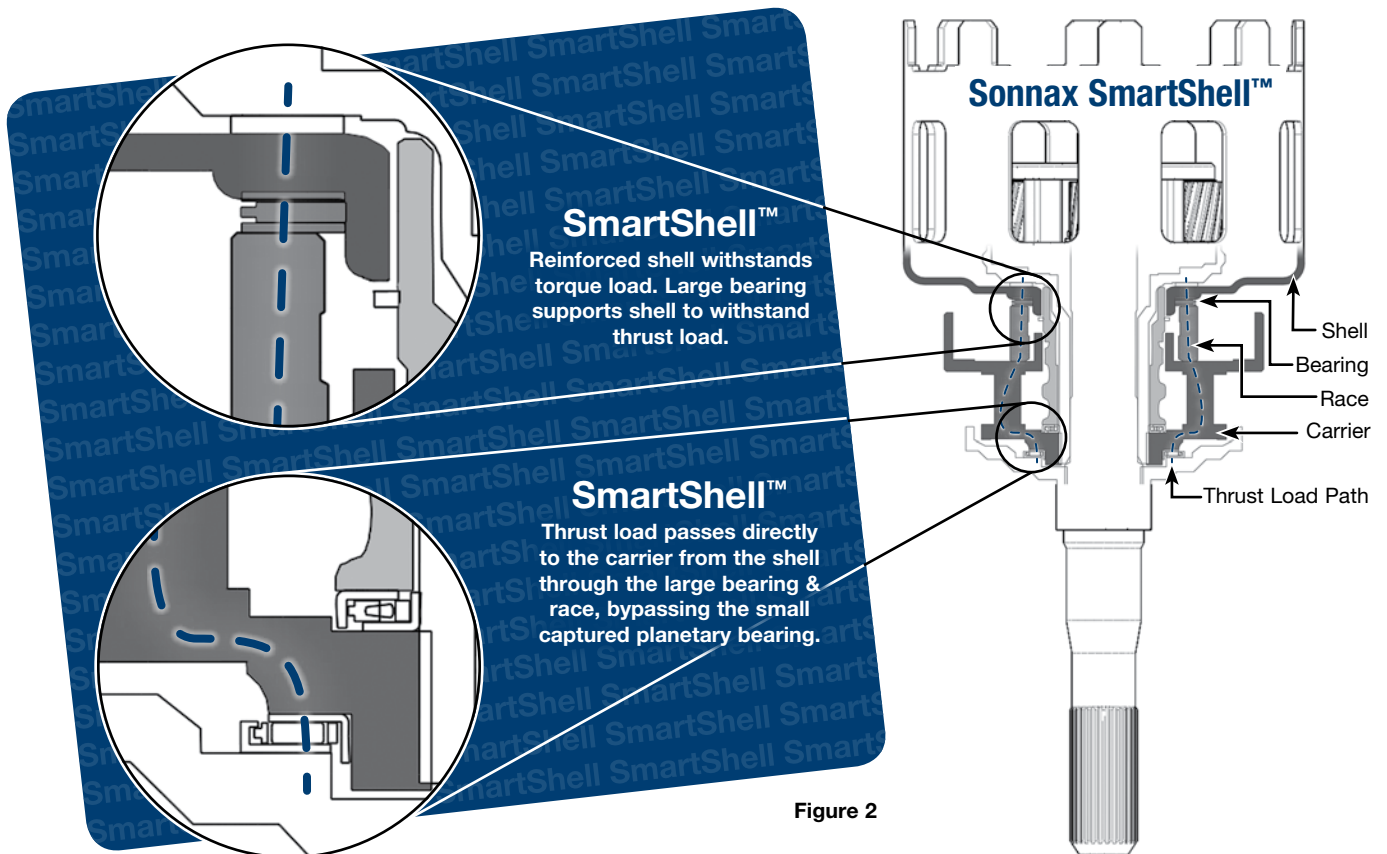


A modified OEM race

This approach not only offers a solution to the sun shell issues, but allows you to save the planet as well!

Part No. 77749-02K Patent Pending

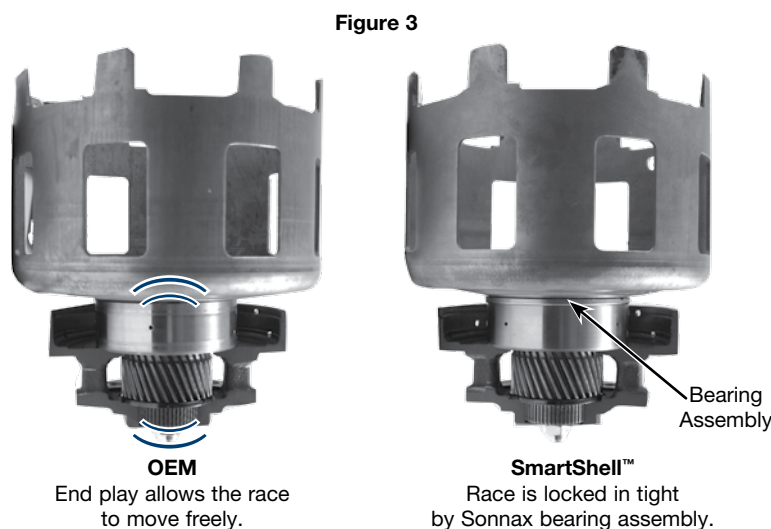
- Reaction Sun Shell
- Bearing Race (2)
- Needle Bearing Assembly
- Modified OEM Roller Clutch Race



Rear Planet Bearing Problems

Another “top five” complaint with the GM 4L60 is the damage to the small captive bearing in the rear planetary assembly. The bearing cannot be replaced without disassembling the carrier, and even then it cannot be replaced with a larger bearing...there just isn't room. This small bearing takes a beating from the thrust load transferred through the sun gear to this location (Figure 1).

By adding our bearing and controlling the height of the modified OEM race included with the Sonnax SmartShell, we reroute the thrust load from the sun gear and the captive bearing. This moves the load to the new large bearing and modified race directly to the rear planet carrier, completely bypassing the vulnerable captive bearing (Figure 2).



In the OEM setup, the end play allows the race to move freely and locks the sun gear and the thrust load into the captive bearing. In the SmartShell setup, the race is locked-in tight, allowing end play (of about .025") in the sun gear. This moves the thrust load from the small captive bearing to the much larger bearing supplied with the SmartShell (Figure 3).

Contact your distributor for more information on the SmartShell or visit www.sonnax.com for all the latest on this new transmission solution from Sonnax.

Part No. 77733-04K

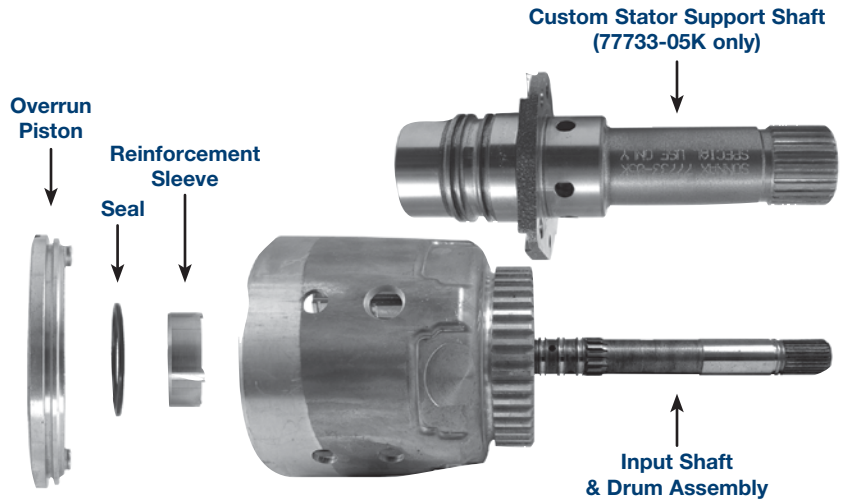
300mm Reluctor Style '04-Later (4L60/65/70-E)

Part No. 77733-05K

300mm Non-Reluctor Style '98-'05 (4L60-E only)

Reinforced Input Housing & Upgraded Input Shaft Kits

- All new high-strength shaft and drum assembly
- 57% harder than OEM shaft
- Reinforced input drum
- Exceptional upgrades with substantial savings



Part No. 77764-01

4L60, 4L60-E, 4L65-E

Billet Forward Piston

- Eliminates concerns of forward piston breakage
- Better durability and strength than OEM cast aluminum forward piston
- Can be used in both early- and late-model transmissions



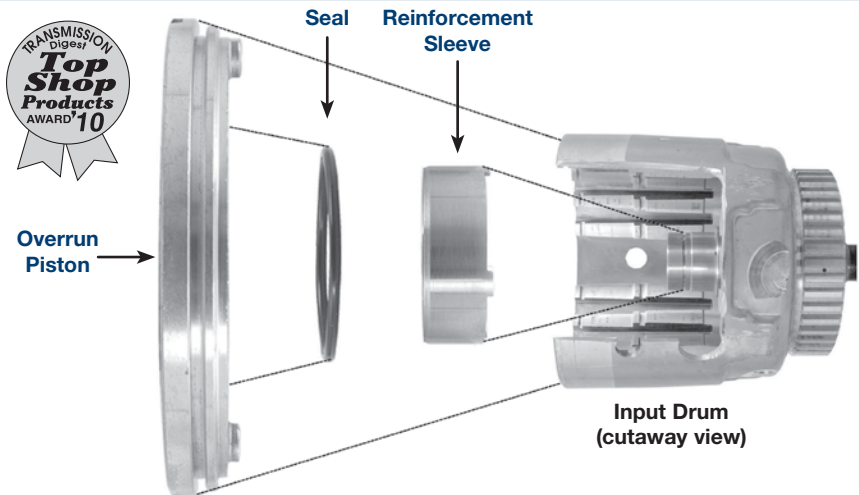
Part No. 77733-01K

4L60, 4L60-E, 4L65-E, 4L70E*

Input Drum Reinforcement Kit

- Sleeve made from hardened Chrome-moly steel
- Includes a reworked OEM piston and O-ring
- Sleeve design will not block clutch feed oil

*Note: Will not repair a cracked drum. Late-model stamped forward pistons must be replaced with early-style cast-aluminum forward pistons.



Part No. 77702BT-01

4L60, 4L60-E, 4L65-E, 4L70E

Kryptonite™ Rear Stator Bushing

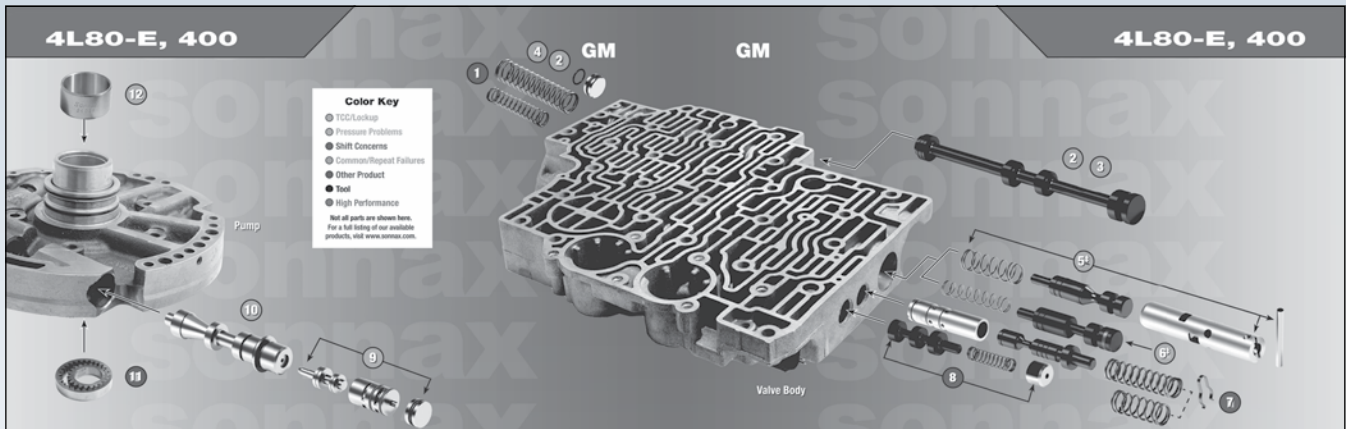
- No machining required
- Wear resistant Teflon® lining
- Closely toleranced I.D. typically found in machined-in-place bushings
- Wider than OEM bushings



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Sonnax Transmission Products Catalog Vol. 8

Valve Body Layouts • Vehicle Complaint Diagnostics
In-Depth Technical Articles • Comprehensive Product Listings



Vehicle Complaints/Part Type	Product Name	Part Number	Illustration Number	4L80-E	400	Product/Application Details	HP or HD Use	Required Tool (Recommended Tool)	Required Fixture
TCC/Lockup	Converter shudder, Burnt converters, TCC apply/release problems, TCC slip codes	TCC Regulator Valve & Sleeve Kit 34994-18K	5	Y		Sleeve corrects worn bore problems		F-34994-TL18	VB-FIX
	No lockup, TCC slip codes, No overdrive, Overheated fluid	TCC Regulator Valve Kit 34994-01K	6	Y		Includes seal, for use in mildly worn bores			
Pressure Problems	High line pressure, Broken parts, Buzzing noise, Uncontrollable line rise	Front Starter Support Bushing 34919-W	12	Y		Wider than OEM for increased support, 4/bag			
	Broken case, serv/clutch piston	Boost Valve & Sleeve Kit 34200-01K	9	Y		Includes O-Rings			
	Engine surge at idle, Reduced cooler flow, Reduced converter release pressure	Boost Valve & Sleeve Kit 34200-03K	9	Y		"Factory" style			
	High/uncontrollable line pressure, Delayed converter charge	Self-Regulating Boost Valve & Sleeve Kit 34200-10K	9	Y	Y	Limits EPC pressure to 95-100 psi			
	Wrong gear starts, Selected codes, Clutch/Band failure, 3rd Neutral condition	Line-to-Label Pressure Regulator Valve Kit 34200-14K	10	Y					
	Loss of 4th accumulator control, Poor shift quality, Damaged accumulator bore	Pressure Regulator Valve Kit 34919-02K	10	Y	Y	71-Later			
	Soft shifts, Low accumulator pressure, Elevated line pressure in drive	Actuator Feed Limit Valve Kit 34200-05K	7	Y					
	Delayed forward engagement, Burned forward clutch/intermediate band	Overized Accumulator Control Valve Kit 34994-22K	8	Y	Y	Repair sleeve, pinless piston & seals			
	Delayed engagements, Low line pressure, Front servo bore wear	Front Servo Piston & Sleeve Kit 34989-00K	Y	Y	Y	Fits all years, upgrades '91-'96 units to '97 specifications			
	No 4th gear, 2-4 Neutral, 3rd Gear starts, Repeated solenoid B Codes B6 or B7	Front Servo Piston & Sleeve Kit 34989-02K	Y	Y	Y				
Shift Concerns	No reverse, Broken low/reverse servo piston	1-1 & 2-4 Shift Valve Spring Kit 34984-00K	1	Y					
	Soft 1-2 & 2-3, Delayed/Sludder in reverse, Poor line rise	Rear Servo Spacer Kit 34528-01K	Y	Y		'96-Later			
		Reverse Boost Valve Kit 34910-01K	Y	Y	Y	Includes O-Rings			
	Reverse Boost Valve Kit 34910-02K	Y	Y	Y	"Factory" style				

Performance Enhancement	Product Name	Part Number	Illustration Number	4L80-E	400	Product/Application Details
HP	4-Pump					
	Material & design upgrades for added strength	Heavy Duty Starter Support Shaft 34919-01			Y	Heat treated chrome-moly



Look Up Application & Unit

Parts are easy to find - we've organized them by application, allowing you to locate all the parts available for a given unit in one place.

Find Your Transmission Problem

Once you've turned to a valve body page, just locate a particular transmission problem – pressure issues, TCC/lockup, shift concerns, etc. – and select the Sonnax part designed to address it.

Identify Special Tools & Performance Products

Any tool, fixture or machining required for a given Sonnax product is clearly identified. Unit-specific parts for high-performance and heavy duty applications also appear on these pages.

View Parts & Valve Bodies

Unit-specific product charts also are accompanied by our award-winning transmission layouts, a quick and easy way to see Sonnax parts "in action." Parts are identified by number for easy cross reference with product charts.



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GM 4T65-E

2-3 Accumulator Valve Kit

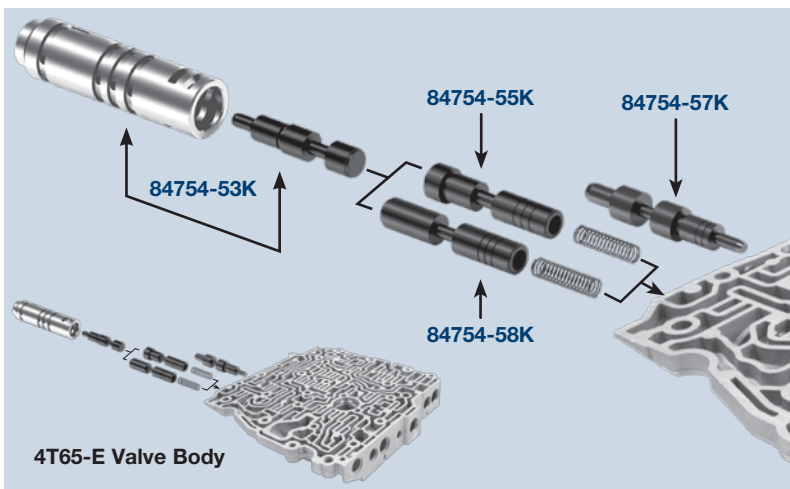
84754-53K replaces the original 2-3 accumulator valve and sleeve. This is an easy-to-install, drop-in replacement. Utilizing the improved ratio found in later units, this kit repairs late design or upgrades early design units.

Oversize 3-4 Accumulator Valve Kits

84754-55K (for GM valve bodies) or **84754-58K** (for Volvo valve bodies) make it possible to service the 3-4 circuit in either design. They require “F-Tool” kit **F-84574-TL55** and the **VB-FIX** valve body reaming fixture.

Oversized 1-2 Accumulator Valve Kit

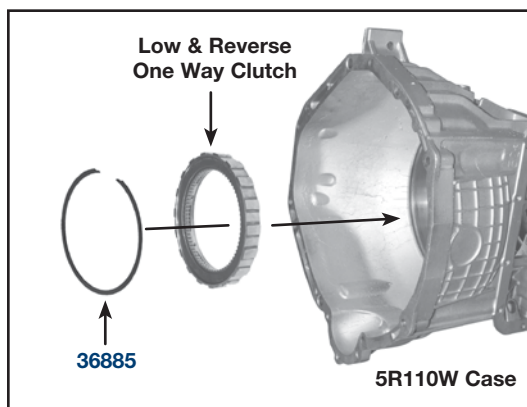
84754-57K corrects worn valves and bores in the 1-2 circuit. The kit requires “F-Tool” kit **F-84574-TL57** and the **VB-FIX**.



Accumulator Valve Kits

The accumulator valves respond to torque signal influence to feed accumulators and control clutch apply pressure and shift feel. Valve and bore wear can allow torque signal, accumulator or line pressures to exhaust, resulting in various shift complaints. The improved designs of Sonnax replacements for 4T65-E accumulator valves establish the optimum shift control, using upgraded material to prevent wear.

Ford 5R110W



Low/Reverse Retaining Ring

5R110W low/reverse retaining rings often “pop out” of the case groove, causing slips in reverse and severe damage to the case lugs. When moving in reverse, radial movement of the pressure plate walks the retaining ring out of its groove. Sonnax retaining ring **36885** is wider and slightly thicker, providing more outward tension and stiffness to help keep the ring seated securely in the case groove. This retaining ring can be used in both gas and diesel applications.

Oversized Manual Valve

Loss of valve body cores due to worn valves and valve body bores. The Sonnax “F-Tool” kit **F-36940-TL-11** oversized the bore, restoring the tight bore-to-valve clearances when used with Sonnax oversized manual valve **36940-11**.



Pressure Switch O-Ringed End Plug Kit

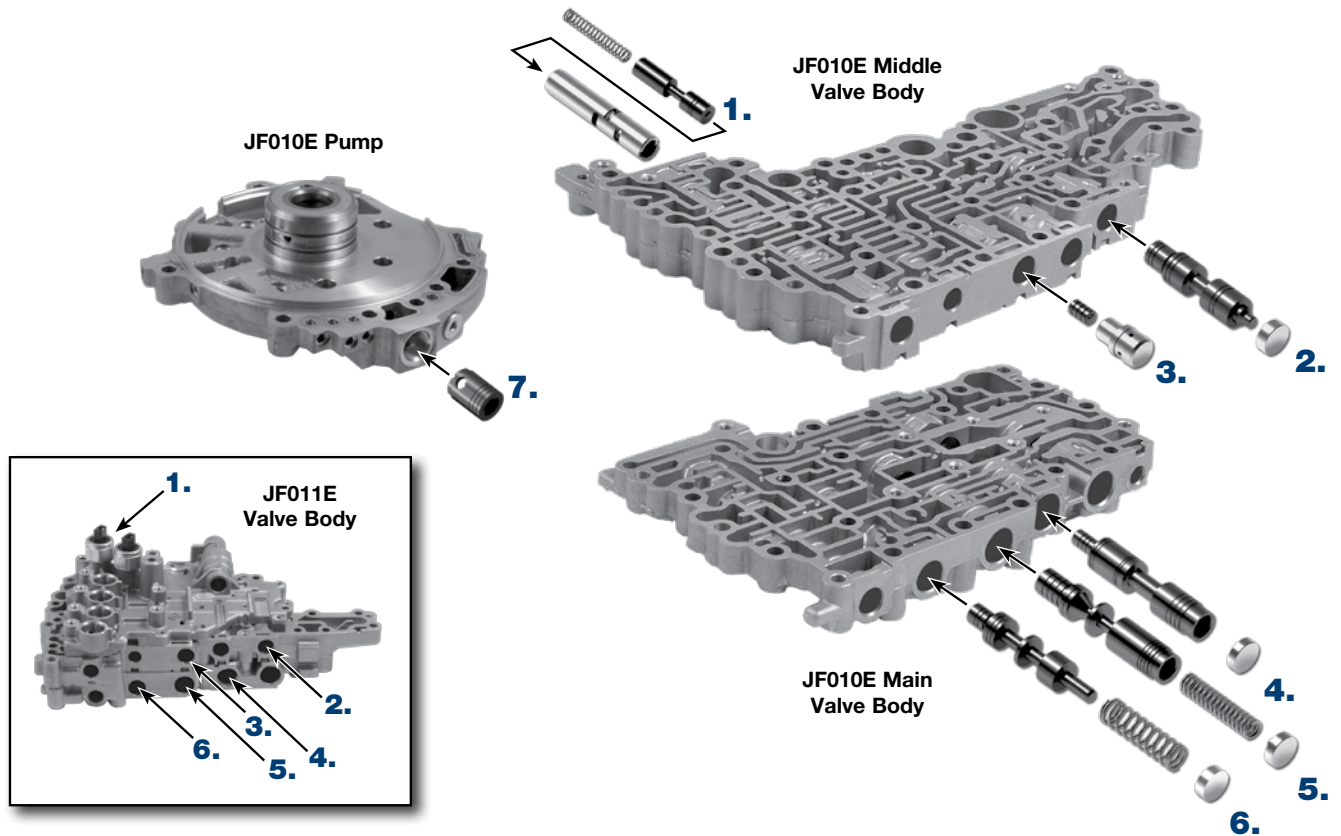
The original design of 5R110W units included five hydraulic pressure switches. Although these switches were never actually utilized, early valve bodies came through with switches installed only to seal up their circuits. Later valve castings were left un-bored and sealed in all locations except the direct clutch pressure switch, which still only served to seal the bore. With the excessive high line pressure that is a frequent problem in these units, it is common to find the OEM pressure switches leaking, causing loss of shift solenoid control pressure and shift complaints. Sonnax drop-in O-ringed end plug kit **36940-17K** includes an O-ring that provides a positive seal to prevent loss of shift control pressure.



Ready for the Jatco/Nissan CVT? We are!

It's great to know that you're ready to solve a transmission problem *before* it comes into your shop.

That's why at Sonnax we're constantly developing cutting-edge valve body repairs for the late-model units coming your way.



PROBLEM	SONNAX SOLUTION	Tool Required	Part Number
<ul style="list-style-type: none"> • Chatter/Noise on acceleration • Loss of ratio change 	1. Solenoid Regulator Valve Kit	—	113741-01K
<ul style="list-style-type: none"> • Chain slippage & pulley fracture • RPM surge/chatter on acceleration 	2. Oversized Secondary Pulley Control Valve Kit	F-113741-TL17 & VB-FIX	113741-17K* 113741-19K*
<ul style="list-style-type: none"> • Jerking on coastdown/harsh engagement • High engine RPM due to no lockup 	3. Lockup Control Sleeve & Plunger Valve Kit	—	113741-11K
<ul style="list-style-type: none"> • Chatter on acceleration • High/Low line pressure 	4. Oversized Primary Pressure Regulator Valve Kit	F-113741-TL9 & VB-FIX	113741-09K
<ul style="list-style-type: none"> • Chain slippage & pulley fracture • RPM surge/chatter on acceleration 	5. Oversized Secondary Regulator Valve Kit	F-113741-TL13 & VB-FIX	113741-13K* 113741-15K*
<ul style="list-style-type: none"> • Engine stalls on engagement • Loss of lockup 	6. Oversized TCC Limit & Lube Valve Kit	F-113741-TL4 & VB-FIX	113741-04K
<ul style="list-style-type: none"> • Slippage • Delayed engagement into forward & reverse 	7. Pump Flow Control Valve	F-113741-TL7C & VB-FIX	113741-07†

*Part Nos. **113741-17K** & **-15K** are for JF010E only and Part Nos. **113741-19K** & **-13K** are for JF011E only. †Part No. **113741-07** fits the JF010E pump only.

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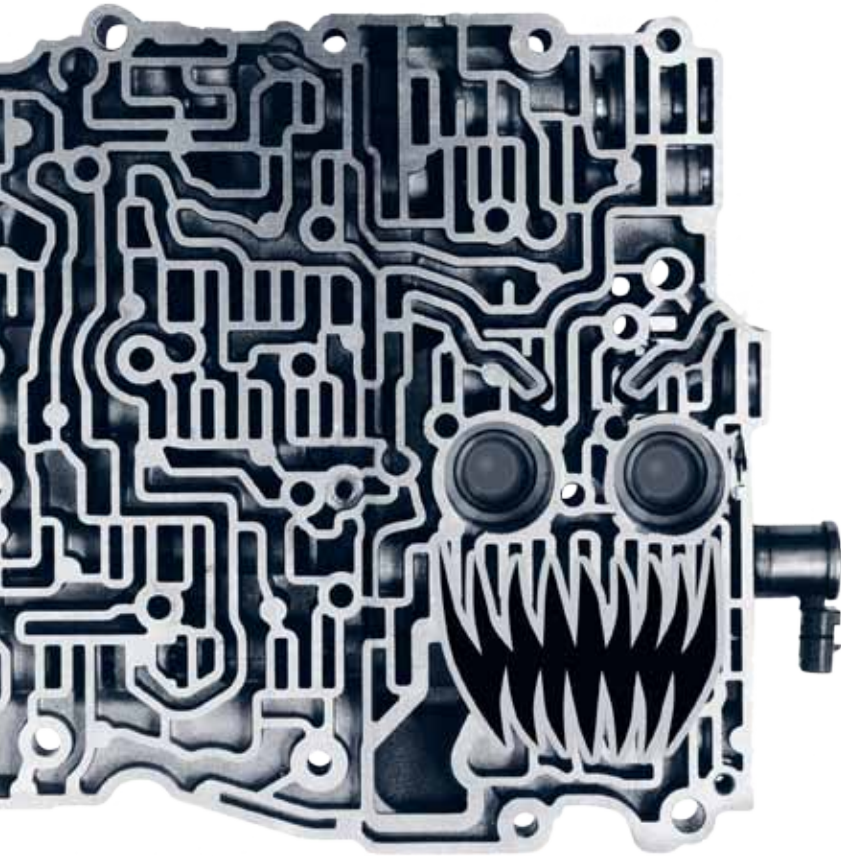
Featured in this issue:

Introducing the Sonnax SmartShell™

New Sonnax Transmission Catalog

Jatco/Nissan CVT Solutions

Sonnax is a leading diversified supplier of specialized drivetrain products to the automotive and commercial vehicle industries, and to industrial sectors utilizing drivetrain technology. We design, manufacture and distribute replacement components worldwide.



**Tough valve
bodies don't
scare us...**

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What makes Sonnax the industry leader in cutting-edge products for valve body repair? A close-knit team of technicians and engineers focused on better solutions – not just new ones – for the transmission problems of today and tomorrow.

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bodies like Sonnax.**[™]

Our newest innovation? **The SmartShell™**
The final word on 4L60 series sun gear
shell problems! [See inside for details.](#)

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